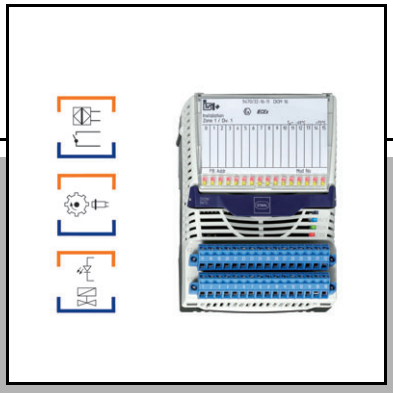

Operating instructions

Digital Input Output Module for Zone 1

> 9470/32

STAHL

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2 General information

2.1 Manufacturer

R. STAHL Schaltgeräte GmbH
Am Bahnhof 30
74638 Waldenburg
Germany

Phone: +49 7942 943-0
Fax: +49 7942 943-4333
Internet: www.stahl-ex.com

2.2 Information regarding the operating instructions

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2.3 Conformity with standards and regulations

Conformity with standards and regulations is specified in the corresponding certificates and the EC Declaration of Conformity. These documents can be downloaded from our homepage www.stahl-ex.com.

3 Symbols used

	Safety notes **Non-compliance can result in material damage, serious injuries or death.** The safety notes contained in these operating instructions and affixed to the device must be observed!
	Warning symbol Danger due to explosive atmosphere!
	Warning symbol Danger due to live components!
☞	**Note** This graphic marks important additional information, tips and recommendations.

4 General safety notes

4.1 Operating instructions storage

Read these operating instructions carefully and store them near the installation place. For correct operation, please observe all other documents enclosed in this delivery and the operating instructions of the equipment to be connected.

4.2 Safety notes

⚠ WARNING	
	Use the devices only for their intended purpose! ▶ We cannot be held liable for damage caused by incorrect or unauthorized use or by non-compliance with these operating instructions. ▶ Use the device only if it is undamaged and clean.

⚠ WARNING	
	Any unauthorized work on the device is prohibited! Installation, maintenance, overhaul and repair may only be carried out by authorized and appropriately trained personnel.

Observe the following information during installation and operation:

- ▶ Any damage can invalidate the explosion protection
- ▶ National and local safety regulations
- ▶ National and local accident prevention regulations
- ▶ National and local assembly and installation regulations
- ▶ Generally recognized technical regulations
- ▶ Safety notes in these operating instructions
- ▶ Characteristic values and rated operating conditions on the rating plates and data plates
- ▶ Additional information plates fixed directly to the device

Additional safety notes:

- The digital input output module Type 9470/32 is approved for use in gas hazardous areas of Zone 1, Zone 2 and in the safe area.
- The digital input output module Type 9470/32 is approved for use in dust hazardous areas of Zone 21 and Zone 22.
- For operation in gas or dust hazardous areas, the module must be installed in an enclosure which fulfills the requirements of IEC/EN 60079-0.
- The module must be mounted on the BusRail 9494 only.
- A distance of 50 mm must be maintained between intrinsically safe and non-intrinsically safe electric circuits.
- Modules with intrinsically safe and non-intrinsically safe field circuits may be operated simultaneously on one BusRail. In this case, a distance of 50 mm must be maintained between the terminals of intrinsically safe and non-intrinsically safe electric circuits (e.g. partition 220101 or empty space).
- The safety-related maximum values of the connected field devices must match the values of the modules according to data sheet, operating instructions or EC type examination certificate.
- Interconnections of several active intrinsically safe circuits can result in different safety-related maximum values. This can endanger the intrinsic safety so that an appropriate proof must be provided.
- Modules and plug connectors may be connected and disconnected during operation in hazardous areas (hot-swap und hot-plug).
- To avoid electrostatic charging, the modules in hazardous areas must be cleaned only with a moist cloth.

4.3 Alterations and modifications

⚠ WARNING	
	Alterations and modifications to the device are not permitted. We shall not accept any liability or warranty obligations for damage resulting from alterations and modifications.

4.4 Special versions

In case of additional/different order options, special versions may differ from the description given here.

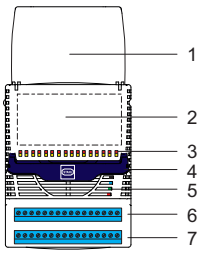
5 Intended use

The digital input output module is used for connecting of up to 16 intrinsically safe digital signals to the IS1 remote I/O system. All channels can be parameterised in pairs as input for connection of passive contacts or NAMUR proximity switches (EN 60947-5-6) or as output for connection of low power solenoid valves. Up to 8 inputs can be used as frequency inputs or counters up to 20 kHz, in operating mode "Rotation direction recognition" and "Forward/backward counter" up to 4 inputs. The Ex i inputs and outputs are short-circuit proof and galvanically separated from the system.

Compatible spare for IS1 I/O modules:
Series 9470/12, 9470/22, 9475/12-08-41

6 Components

6.1 Overview



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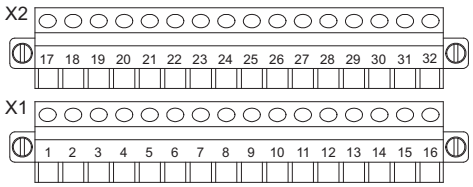
1	Operating flap with insert label (open) and connection diagram
2	Module data (serial number, hardware revision number, software revision number, manufacturing date, e.g.: 123456DE9999 Rev.A 01-01 0508)
3	LEDs (red) for error indication (wire breakage/short circuit) for each channel; LEDs (yellow) for status indication (ON/OFF) for each channel
4	Notch lever for removing the module from the BusRail
5	LED for operation indication ("RUN", green), error ("ERR", red) and maintenance ("M/S", blue) (for further information, see "LED indications and troubleshooting")
6	Pluggable terminal X2
7	Pluggable terminal X1

6.2 Pluggable terminals X1 and X2

For the module, two pluggable terminals X1 and X2 (screw-type terminals 162702, 162718 or spring clamp terminals 162695, 162716) for connection of field devices are available as accessories (not included in the scope of delivery of the module!).
The pluggable terminals X1 and X2 have 16 terminals for connection of the field cables.



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Terminal assignment

	X1
Channel	Terminals
0	1(+), 2(-)
1	3(+), 4(-)
2	5(+), 6(-)
3	7(+), 8(-)
4	9(+), 10(-)
5	11(+), 12(-)
6	13(+), 14(-)
7	15(+), 16(-)

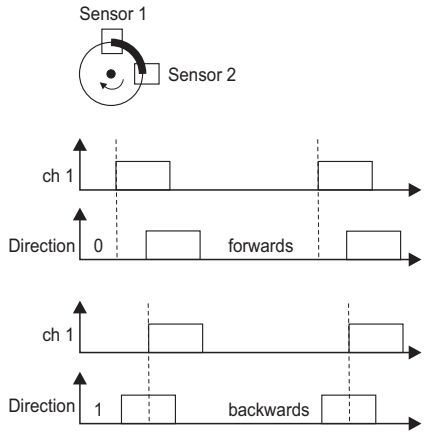
	X2
Channel	Terminals
8	17(+), 18(-)
9	19(+), 20(-)
10	21(+), 22(-)
11	23(+), 24(-)
12	25(+), 26(-)
13	27(+), 28(-)
14	29(+), 30(-)
15	31(+), 32(-)

NOTICE	
☞	To increase the output power, channels can be switched in parallel. This results in new safety data (see chapter 7).

NOTICE	
☞	For the operating mode "Frequency" or "Counter" only channels 8 ... 15 are used.

In the operating mode "Counter with direction" or "Frequency with direction", two adjacent channels are operated together. Thereby, the following channel assignment applies:

- First channel (8, 10, 12, 14) = signal value (1 or 0)
- Second channel (9, 11, 13, 15) = direction (0 = forward, 1 = backward)



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7 Technical data

Explosion protection

Global (IECEx)	
Gas and dust	IECEx DEK 12.0044X Ex ia [ia Ga] IIC T4 Gb [Ex ia Da] IIIC
Europe (ATEX)	
Gas and dust	DEKRA 12ATEX0099X Ⓔx II 2 (1) G Ex ia [ia Ga] IIC T4 Gb Ⓔx II (1) D [Ex ia Da] IIIC
USA (FM)	in preparation
Certificates and approvals	
Certificates	IECEx, ATEX
Further parameters	
Installation	in Zone 1, Zone 2, Zone 21, Zone 22 and in the safe area
Safety data	
Max. voltage U_o	9.8 V
Max. internal inductance L_i	negligible
1 channel	
Max. current I_o	10.4 mA
Max. power P_o	25.5 mW
Max. internal capacity C_i	2.5 nF
Max. connectable inductance L_o/capacity C_o	

IIC	L_o [mH]	280	100	50	20	10	5	2	1	0.5	0.2	0.1	0.02
	C_o [µF]	–	0.49	0.56	0.64	0.72	0.81	0.96	1.1	1.3	1.6	2	3.3
IIB/IIIC	L_o [mH]	1000	100	50	20	10	5	2	1	0.5	0.2	0.1	0.01
	C_o [µF]	–	2.6	2.8	3.3	3.7	4.2	5.1	6	7.2	9.3	12	23

2 channels in parallel

Max. current I_o: 20.8 mA

Max. power P_o: 51 mW

Max. internal capacity C_i: 5 nF

Max. connectable inductance L_o/capacity C_o

IIC	L_o [mH]	100	50	20	10	5	2	1	0.5	0.2	0.1	0.02
	C_o [µF]	0.3	0.44	0.57	0.67	0.77	0.93	1.1	1.3	1.6	2	3.3
IIB/IIIC	L_o [mH]	270	100	50	20	10	5	2	1	0.5	0.2	0.1	0.01
	C_o [µF]	–	2.3	2.6	3.1	3.6	4.1	5.1	6	7.2	9.3	12	23

4 channels

Max. current I_o: 41.6 mA

Max. power P_o: 102 mW

Max. internal capacity C_i: 10 nF

Max. connectable inductance L_o/capacity C_o

IIC	L_o [mH]	27	20	10	5	2	1	0.5	0.2	0.1	0.01
	C_o [µF]	0.32	0.41	0.56	0.69	0.88	1	1.2	1.6	2	3.3
IIB/IIIC	L_o [mH]	100	50	20	10	5	2	1	0.5	0.2	0.1	0.01
	C_o [µF]	1.5	2.1	2.8	3.4	3.9	4.9	5.9	7.1	9.3	12	23

8 channels

Max. current I_o: 83.2 mA

Max. power P_o: 204 mW

Max. internal capacity C_i: 20 nF

Max. connectable inductance L_o/capacity C_o

IIC	L_o [mH]	6.7	5	2	1	0.5	0.2	0.1	0.01		
	C_o [µF]	0.4	0.5	0.76	0.96	1.2	1.6	1.9	3.3		
IIB/IIIC	L_o [mH]	29	20	10	5	2	1	0.5	0.2	0.1	0.01
	C_o [µF]	1.7	2.1	2.9	3.6	4.7	5.7	6.9	9.1	11	23

16 channels

Max. current I_o: 164 mA

Max. power P_o: 402 mW

Max. internal capacity C_i: 40 nF

Max. connectable inductance L_o/capacity C_o

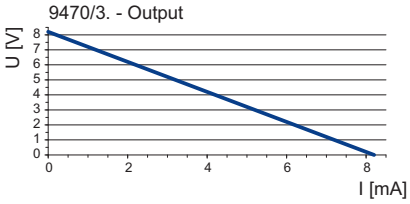
IIC	L_o [mH]	1.8	1	0.5	0.2	0.1	0.01		
	C_o [µF]	0.53	0.77	1	1.5	1.8	3.3		
IIB/IIIC	L_o [mH]	7.7	5	2	1	0.5	0.2	0.1	0.01
	C_o [µF]	2.1	2.8	4.2	5.3	6.6	8.9	11	23

Electrical data

Ex i inputs/outputs

Number of channels	16 (in pairs with adjustable parameters as input or output)
Inputs	
Max. number of channels	16
Min. input signal ON	2.1 mA
Max. input signal OFF	1.2 mA
Operating point	1.65 mA
Supply voltage	8.2 V
Internal resistance	1 kΩ
Signal	EN 60947-5-6 (NAMUR)
Frequency input	
Max. number of channels	8
Max. switching frequency	20 kHz (at frequencies > 1 kHz the maximum conductor length is reduced, e.g. at 5 kHz to approx. 75 m)
Min. pulse width	25 µs

Measuring range	0.1 Hz … 600 Hz	1 Hz … 3 kHz	1 Hz … 20 kHz
Resolution	0.01 Hz	0.05 Hz	0.5 Hz
Accuracy	0.1 %	0.1 %	0.1 %

Counter	
Max. number of channels	8
Counting range	0 ... 65535 als UINT16
Rotation direction recognition, forward/backward counter	
Max. number of channels	4 (each two inputs switched in parallel)
Function	Up/down counter; Frequency with direction
Resolution	16 bit / 32 bit
Outputs	
Max. number of channels	16
Application	Ex i low-power solenoid valves
Open-circuit voltage	8.2 V
Max. output current	8.2 mA
Internal resistance	1 kΩ
Rated operation	6 V / 2 mA
Output characteristic	

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Signal transmission	
Max. delay from signal / internal bus	< 1 ms

Max. delay from frequency input / internal bus

Filter	without	small	medium	large
Frequency				
0.1 Hz ≤ f < 1 Hz	1/f + 1 ms	2/f	3/f	6/f
1 Hz ≤ f < 10 Hz	1/f + 1 ms	4/f	9/f	18/f
10 Hz ≤ f < 100 Hz	1/f + 1 ms	8/f	27/f	54/f
100 Hz ≤ f < 1 kHz	1/f + 1 ms	16/f	81/f	162/f
1 kHz ≤ f < 1960 Hz	1.5 ms	32/f	243/f	486/f
1960 Hz ≤ f < 10 kHz	1.5 ms	16.5 ms	124 ms	248 ms
10 kHz ≤ f < 20 kHz	1.5 ms	33 ms	372 ms	744 ms
f ≥ 20 kHz	1.5 ms	66 ms	372 ms	744 ms

Galvanic separation	
Test voltage	
acc. to standard	EN 60079-11
Between auxiliary power/ system components	≥ 1500 V AC
Between two I/O modules	≥ 500 V AC
Between I/O channels/ system components	≥ 500 V AC
Between I/O channels/ ground (PA)	≥ 500 V AC
Electromagnetic compatibility	Tested to the following standards and regulations: EN 61326-1 (2006) IEC 61000-4-1 … 6, NAMUR NE 21
Electrical connection	
Power supply	BusRail Types 9494
Ex i field signals	Pluggable, blue terminals, 16-pole, 2.5 mm^2, screw- or spring-type versions with lock
Auxiliary power	
Version	Intrinsically safe Ex ia via BusRail
Max. current consumption	120 mA
Max. power consumption	2.5 W
Max. power dissipation	2.5 W
Device-specific data	
Settings	
Module	
Diagnostics message	ON / OFF
Signal	
Signal type	Input / output*)
Pulse extension / frequency filter	0 s / off; 0.6 s / small; 1.2 s / medium; 2.4 s / large *)
Inverting input/output	normal / inverted*)
Line error monitoring	ON / OFF
Behaviour in case of error	Replacement value '0'; replacement value '1'; hold (initial value 0); hold (initial value 1)
Operating mode counter/ frequency	Counter 16 bit; 0.1 ... 600 Hz; 1 Hz ... 3 kHz; 1 Hz ... 20 kHz; 1 Hz ... 20 kHz with direction; up/down counter 16 bit; up/down counter 32 bit*)
Counter control	Run, Stop, Reset
Counting event	positive slope; negative slope*)
	*) setting is made for channel pairs
Ambient conditions	
Ambient temperature	-40 … +75 °C
Storage temperature	-40 … +80 °C
Maximum relative humidity	95 % (without condensation)
Semi-sinusoidal shock (IEC EN 60068-2-27)	15 g (3 shocks per axis and direction)
Sinusoidal vibration (IEC EN 60068-2-6)	1 g in the frequency range 10 ... 500 Hz 2 g in the frequency range 45 ... 100 Hz
Mechanical data	
Degree of protection (IEC 60529)	IP20
Module enclosure	polyamide 6GF
Fire resistance (UL 94)	V2
Pollutant class	corresponds to G3
Dimensions	L = 128 mm, W = 96.5 mm, H = 67 mm

Indication	
LED indication	
Module requires maintenance	LED "M/S", blue
Operating state	LED "RUN", green
Group error	LED "ERR", red
Channel error	LED red, for each channel
Channel status	LED yellow, for each channel
Function indication	
Retrievable parameters	Manufacturer, Type, hardware revision, software revision, serial number
Error indication	
Module status and alarms	• Internal bus error primer / redundant • No response from IOM • Configuration does not correspond to the module • Hardware error • Excess temperature • Slot error • Module requires maintenance
Signal errors for each channel	
Signal status bit	"0" = signal disturbed; "1" = signal valid
Wire breakage input/output	< 50 µA
Short circuit input/output	< 100 Ω Note: Contacts require circuitry with 1.2 kΩ in series and 15 kΩ in parallel for wire breakage/short-circuit detection. For outputs, wire breakage/short-circuit detection is only possible in the ON state.
Mounting / installation	
Mounting orientation	horizontal or vertical
Mounting type	on 35 mm DIN rail NS 35/15 (DIN EN 60715)

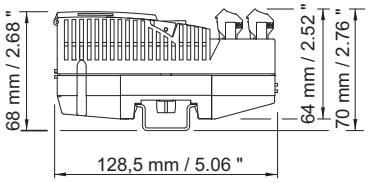
8 Transport and storage

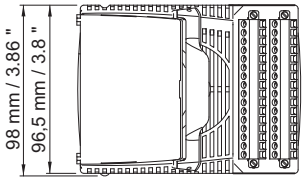
- Transport and storage are only permitted in the original packaging.
- The devices must be stored in a dry place and vibration-free.

9 Installation

9.1 Dimensions / fastening dimensions

Dimensional drawings (all dimensions in mm / inches) - subject to modifications





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9.2 Installation conditions

⚠ WARNING	
	The national installation instructions (e.g. IEC/EN 60079-14) must be observed. Ensure that there is a distance of at least 50 mm (safety distance) between connecting units of intrinsically safe and non-intrinsically safe circuits!

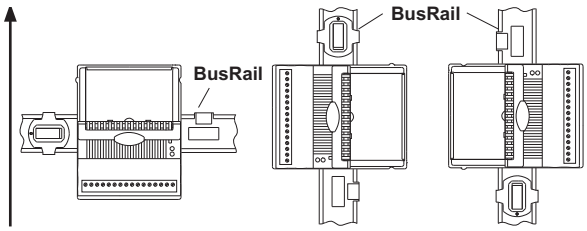
⚠ WARNING
If the installation has strong electromagnetic sources of interference, use of shielded field cables is recommended. In this case, the shield must be connected to the equipotential bonding of the hazardous area! For this purpose, the shields of the field wiring must be connected to the shield busses installed in the enclosure as close to the entry point as possible! The shield busses must be also connected to the mounting plate close to the entry point of the field wiring using the shortest possible way!

9.3 Mounting and operating position

Mounting the module on BusRail

NOTICE
The module and the pluggable terminals X1 and X2 can be safely connected or disconnected during operation in a hazardous area (hot swap).

NOTICE
Module operation is permitted only in the following mounting positions: Vertical mounting with pluggable terminals below, on the left or right.



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- ▶ Position the module vertically on the provided slot of the BusRail
- ▶ Snap module into place by slightly pressing it

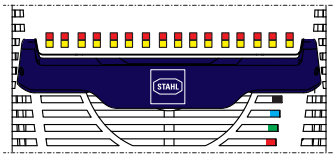
Connecting field devices to the module

NOTICE
The mounting can be carried out with connected or disconnected terminals. In the operating flap, there is a insert label which can be used to enter the assignment of the field devices to the channels. Labelling of the insert label can be performed, for example by means of the IS Wizard.

- ▶ Connect field devices to terminals X1 and X2 according to terminal assignment (see on the front or on insert label under the operating flap) (tightening torque for screw-type terminals 0.5 ... 0.6 Nm)
- ▶ Place the field wiring shields (if present) as close to the entry point on the grounding rail as possible
- ▶ Plug the pluggable terminals X1 and X2 into the module and secure them against loosening using safety screws (tightening torque 0.5 ... 0.6 Nm)
- ▶ Mount partition if necessary (distance between intrinsically safe and non-intrinsically safe electric circuits at least 50 mm)

9.4 LED indications and troubleshooting

Meaning of the LEDs



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- LED "RUN", green = operation indication
- LED "ERR", red = module error indication
- LED "M/S", blue = requires maintenance or outside specification
- 16 x LED, red = error in the respective field circuit
- 16 x LED, yellow = signal state indication

Indication overview

	Module state	Error source	Possible solution
LED "RUN", green			
ON	Normal operation	--	--
FLASHES	In standby (switched on but no data exchange with master yet)	The module is in proper condition but is not ready for cyclic data exchange yet (there is no parameter set available yet). Outputs in a state without power.	• Activate the cyclic data transfer with the master • Check master, bus connection and CPM
OFF	No function	No supply voltage at the I/O module or I/O module is defective.	• Check system supply • Check CPM or CPU&PM • Check the BusRail • Engage the I/O module correctly on the BusRail • Replace the I/O module
LED "ERR", red			
OFF	No error	--	--
FLASHES	External error	Error in the field circuit: wire breakage, short circuit	• Check signal LEDs "red" • Eliminate the cause in the indicated field circuit, check electric lines and field device
	Incorrectly configured module	Configuration is not correct or a wrong module is connected	• Change configuration in the automation system or connect the right module
	Outputs in safety position	Cyclic data transfer with the automation system has been interrupted	• Check the cyclic data transfer of CPM or CPU (LCD or LED "RUN") • Check bus connection • Activate the cyclic data transfer with the automation system
ON	Module error	Module is defective	• Replace the module
LED "M/S", blue			
OFF	Normal operation	--	--
FLASHES	External maintenance required	Ambient temperature is outside the specification	• Reduce ambient temperature by means of, e.g. shading or cooling **Note: If the problem is not eliminated, the module will be permanently damaged**
ON	Maintenance required	Slot error or module is damaged by excess temperature or end of the service life reached	• Replace the module as soon as possible within the next 12 months, otherwise there is a risk of module failure

	Module state	Error source	Possible solution
16 x LED, red			
OFF	Normal operation	--	--
FLASHES	Signal error	Line breakage or short circuit	• Eliminate the cause in the indicated field circuit, check electric lines and field device **Note: Signal error can be detected in the ON state only**
16 x LED, yellow			
OFF	No input/output signal	--	--
ON	Input/output signal present	--	--

9.5 Dismounting / replacement of the module

⚠ WARNING

If a partition is mounted, first pull out terminals X1 and X2 from the module to be replaced.

NOTICE

☞ When replacing the module by a module identical in construction, the set parameters are maintained. No further user adjustments are necessary.
When replacing the module by a module with a different function, the module reports a configuration error (red LED "ERR" flashes). The module must be either re-parameterised or it is necessary to connect a module of the right type.

NOTICE

☞ If an IS1 module is replaced by an IS1+ module with the same functions, the IS1+ module functions in the compatibility mode (= identical functionality). If new IS1+ functions must be used, it may be necessary to update the software of CPM 9440 or CPU 9441.
In case of PROFIBUS DP operation, a new GSD may be required. If required, contact your responsible distributor for further information.

- ▶ Loosen safety screws of the pluggable terminals X1 and X2
- ▶ Pull out the terminals from the module
- ▶ If required, remove the partition
- ▶ Pull the blue notch lever of the module upwards to unlock the module
- ▶ Remove the module vertically from the BusRail
- ▶ Position the new module vertically onto the BusRail and snap into place by slightly pressing it
- ▶ If required, snap partition into place between modules
- ▶ Plug the pluggable terminals X1 and X2 into the module and secure them against loosening (tightening torque 0.5 ... 0.6 Nm)

10 Maintenance, overhaul and repair

10.1 Maintenance

The module does not require regular maintenance.

- ▶ Observe the function according to intended use
- ▶ Follow the directives according to IEC/EN 60079-17
- ▶ Adhere to permissible temperatures according to IEC/EN 60079-0

NOTICE	
☞	If the blue LED "M/S" lights up continuously, it is recommended to replace the module in the foreseeable future. Otherwise there is a high probability that the module will fail in 12 months (see "LED indications and troubleshooting").

10.2 Repair instructions

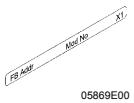
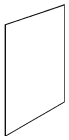
NOTICE	
☞	Repair must be performed by the manufacturer only! When repair is required, send the module to your responsible sales organization (for the address, see chapter 2.1).

11 Disposal

- ▶ Observe the national waste disposal regulations.

12 Accessories and spare parts

⚠ WARNING	
	Explosion hazard due to wrong or insufficient spare parts or wrong accessories! For components with relevant Ex protection, use only suitable, certified spare parts or corresponding accessories of R. STAHL Schaltgeräte GmbH or other manufacturers. Otherwise, explosion protection cannot be guaranteed any longer. R. STAHL Schaltgeräte GmbH cannot be held liable for damage caused by ignoring this danger.

Designation	Figure	Description	Art. no.	Weight kg
Plug-in terminal	02079E00	2.5 mm² with lock, 16-pole, screw connector, blue, for connecting the field signals to I/O modules, for intrinsically safe field circuits Labelling: 1 ... 16	162702	0.028
		2.5 mm² with lock, 16-pole, screw connector, blue, for connecting the field signals to I/O modules, for intrinsically safe field circuits Labelling: 17 ... 32	162718	0.028
	02077E00	2.5 mm² with lock, 16-pole, spring clamp connection, blue, for connecting the field signals to I/O modules, for intrinsically safe field circuits, incl. test jacks Labelling: 1 ... 16	162695	0.028
		2.5 mm² with lock, 16-pole, spring clamp connection, blue, for connecting the field signals to I/O modules, for intrinsically safe field circuits, incl. test jacks Labelling: 17 ... 32	162716	0.028
Labelling strips	 05869E00	"FB Addr ... Mod No ..." for pluggable terminal, sheet with 26 strips	162788	0.001
DIN A4 sheet	 09900E00	For label plate on I/O modules; 6 labels on each sheet; print-out using IS Wizard; packaging unit = 20 sheets	162832	0.001
Partition	15196E00	For mounting between intrinsically safe and non-intrinsically safe connections of the I/O modules, in order to adhere to the required 50 mm distance	220101	0.000
Warning sign	05872E00	"Clean modules only with a damp cloth."	162796	0.001

13 EC Declaration of Conformity

EG-Konformitätserklärung
EC Declaration of Conformity
Déclaration de Conformité CE

R. STAHL Schaltgeräte GmbH • Am Bahnhof 30 • 74638 Waldenburg, Germany
erklärt in alleiniger Verantwortung, *declares in its sole responsibility, déclare sous sa seule responsabilité,*

dass das Produkt: *that the product:* *que le produit:*	**Digital Input Output Modul** *Digital Input Output Module* *Module d'entrée et de sortie numérique*
Typ(en), *type(s), type(s):*	**9470/3b-16-1f (b = 2, 3 ; f = 0, 1)**

mit den Anforderungen der folgenden Richtlinien und Normen übereinstimmt.
is in conformity with the requirements of the following directives and standards.
est conforme aux exigences des directives et des normes suivantes.

Richtlinie(n) *Directive(s)* *Directive(s)*	Norm(en) *Standard(s)* *Norme(s)*
94/9/EG: ATEX-Richtlinie *94/9/EC: ATEX Directive* *94/9/CE: Directive ATEX*	EN 60079-0: 2012 EN 60079-11: 2012 EN 60079-15: 2010
Kennzeichnung für, *marking for, marquage pour:* **9470/32-16-1***	**II 2 (1) G Ex ia [ia Ga] IIC T4 Gb** **II (1) D [Ex ia Da] IIIC** **CE 0158**
Kennzeichnung für, *marking for, marquage pour:* **9470/33-16-1***	**II 3 (1) G Ex nA ia [ia Ga] IIC T4 Gc** **II (1) D [Ex ia Da] IIIC** **CE 0158**
EG-Baumusterprüfbescheinigung: *EC Type Examination Certificate:* *Attestation d'examen CE de type:*	**DEKRA 12 ATEX 0099 X** (DEKRA Certification B.V., Utrechtseweg 310, 6812 AR Arnhem, The Netherlands)
2004/108/EG: EMV-Richtlinie *2004/108/EC: EMC Directive* *2004/108/CE: Directive CEM*	EN 61326-1: 2006
Sonstige Normen: *Other Standards:* *Autres normes:*	EN 50178: 1997 EN 61010-1: 2010

Waldenburg, 07.02.2013
Ort und Datum
Place and date
Lieu et date

i.V.
M. Kaiser
Leiter Zertifizierung Produkte Automatisierung
Head of Certification Products Automation
Directeur Certification Produits Automation

i.V.
J.-P. Rückgauer
Leiter Qualitätsmanagement
Director Quality Management
Directeur Assurance de Qualité

F-4174-601 01/2011 STMZ

9470 6 002 001 0_00

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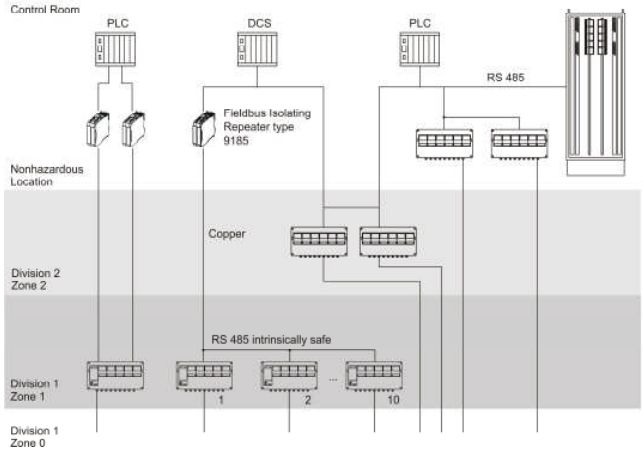
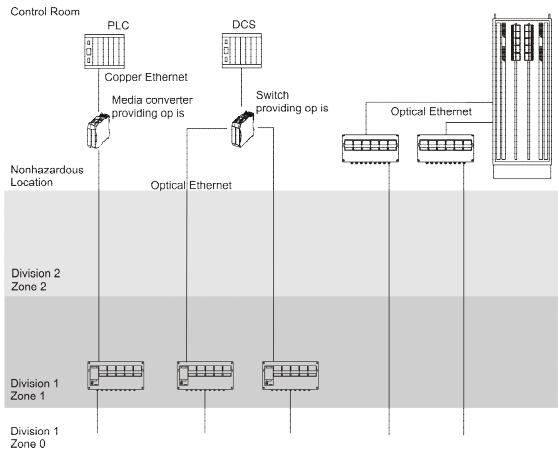
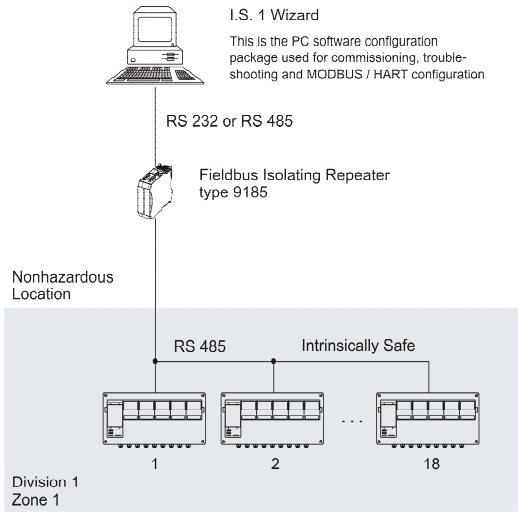


Example for Fieldbus System Topology with Bus Isolators interfacing Automation control systems with DIV 1 / Zone 1 installation of IS1 resp. IS1+ Remote I/O System



Example for Ethernet System Topology with Isolators Interfacing Automation control systems with DIV 1 / Zone 1 installation of IS1 resp. IS1+ Remote I/O System



Service Bus with Isolating Repeater interface

The IS1 resp. IS1+ Remote I/O is a DIN rail mounted system designed to record and output process control signals between hazardous location transducers, sensors and a nonhazardous location automation system. It consists of electrical apparatus in a Class I, Division 1 or Class I, Zone 1 hazardous locations linked by an intrinsically safe field bus installed per the National Electrical Code, ANSI/NFPA 70 Article 500.

The intrinsically safe field bus circuit is achieved with the use of the Fieldbus Isolating Repeater type 9185 (copper to copper interface) or 9186 (fiber optic to copper interface). These devices reside in the nonhazardous location and provide a intrinsically safe field bus circuit for connection to the IS1 resp. IS1+ Remote I/O System. See example to the left.

The apparatus located in the Division 1 or Zone 1 hazardous location are referred to as Remote I/O, and consist of the following major subsystems.

Notes:

1. CPU & Power Module, Type 9440
   The CPU and Power Module contains a power supply unit for its own power supply, as well as for the supply to the I/O modules and the field circuits. The power supply to the I/O modules is implemented via the BusRail. For the configuration with a redundant CPU and Power Module the power supply to the I/O modules is decoupled with diodes. The power supply unit has an undervoltage monitoring circuit.

   The CPU fulfils the function of a gateway between the internal bus of an IS1 field station and the fieldbus which connects the field station with the automation system. The gateway is constructed as a dual processor system. The I/O processor controls the data exchange with the I/O modules and, when plugged-in, with the redundant CPU & Power Module. The communication processor controls the data exchange on the fieldbus, the redundant fieldbus and on the Service Bus.

   The communication with the I/O modules is implemented via the address and data lines on the BusRail. The interface of the CPU & Power Module with the internal data bus on the BusRail is designed with redundancy.

2. CPU Module Type 9441 and Power Module Type 9444
   The IS1 System for Ethernet uses a separate Power Module and CPU Module pluggen onto an associated Socket instead of the CPU&Power Supply Type 9440. Except for the external communication which is achieved via optical fibre interface, the Power Module and the CPU Module provide similar functions as the CPU&Power Module type 9440.

3. Components of Remote I/O System
   All I/O Modules are manufactured in a unique DIN rail mount package which then mount onto the Remote I/O system BusRail.

4. Refer to pages 4 through 25 for information specific to each module.

GENERAL NOTES:

1. Installation should in accordance with Article 504/505 of the National Electrical Code, ANSI/NFPA 70 and ANSI/ISA RP12.06.01 resp. with the Canadian Electrical Code, Part I.
2. Use a general purpose enclosure meeting the requirements of ANSI/ISA S82 for use in nonhazardous or Class I, Division 1 hazardous (Classified) Locations.
3. Use an FMRC Approved or NRTL listed Dust-ignitionproof enclosure appropriate for environment protection in Class II, Division 1, Groups E, F and G; and Class III, hazardous (Classified) Locations.
4. Substitution of components may impair suitability for Zone 1 and / or Intrinsic Safety.

The safety relevant statements of this document may be transferred into the operating instructions.
Transferring the text, editorial changes of equivalent meaning are allowed.

			2013	Date	Name	Certification drawing	Scale: none
			drawn	08.02.	Reistle	**IS1 resp. IS1+ Remote I/O System Overview**	
			checked		Kaiser		Sheet: 1 of 32
					STAHL	9400 6 031 001 1	Agency: FM
02	26.02.2014	Bagusch					
01	22.01.2014	Bagusch					
Version	Date	Name				Ers. f. / Ers. d.	A4

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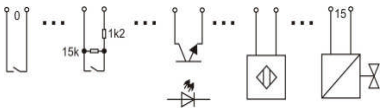
Nonhazardous
Class I, II, III, Division 1, Group A-G
or Class I, Zone 1, Group IIC/IIB
Hazardous (Classified) Locations

NAMUR Signal < 1.2 / > 2.1 mA



FM approved NAMUR proximity switches,
optocouplers, low power valves

The Type 9470 Digital Input Output Module is designed to receive up to 16 discrete input signals from dry contacts and NAMUR proximity sensors etc. and transfer them to the IS1 CPU & Power Module. It is also possible to drive low power valves. The module is intrinsically safe for installation in a Class I, II, III, Division 1, Group A-G or Class I, Zone 1, Group IIC/IIB hazardous location according to NEC Article 504/505 and provides intrinsically safe connections for Class I, Division 1, Groups A-G or Class I, Zone 0, Group IIC/IIB hazardous locations listed below.

Entity parameters for wiring configuration to the left are as follows:

	CL I, DIV 1, A,B / Zone 0, GP IIC		CL I, DIV 1, C-G / Zone 0, GP IIB/IIIC	
	La [mH]	Ca [µF]	La [mH]	Ca [µF]
single channel	280	-	1000	-
	100	0.49	100	2.6
V_{OC} = 9.8 V	50	0.56	50	2.8
I_{SC} = 10.4 mA	20	0.64	20	3.3
P_O = 25.5 mW	10	0.72	10	3.7
Ci = 2.5 nF	5	0.81	5	4.2
Li = 0 mH	2	0.96	2	5.1
	1	1.1	1	6.0
	0.5	1.3	0.5	7.2
	0.2	1.6	0.2	9.3
	0.1	2.0	0.1	12.0
	0.02	3.3	0.01	23.0
2 parallel connected ch.	-	-	270	-
	100	0.3	100	2.3
V_{OC} = 9.8 V	50	0.44	50	2.6
I_{SC} = 20.8 mA	20	0.57	20	3.1
P_O = 51.0 mW	10	0.67	10	3.6
Ci = 5 nF	5	0.77	5	4.1
Li = 0 mH	2	0.93	2	5.1
	1	1.1	1	6.0
	0.5	1.3	0.5	7.2
	0.2	1.6	0.2	9.3
	0.1	2.0	0.1	12.0
	0.02	3.3	0.01	23.0
4 parallel connected ch.	-		100	1.5
	27	0.32	50	2.1
V_{OC} = 9.8 V	20	0.41	20	2.8
I_{SC} = 41.6 mA	10	0.56	10	3.4
P_O = 102.0 mW	5	0.69	5	3.9
Ci = 10 nF	2	0.88	2	4.9
Li = 0 mH	1	1.0	1	5.9
	0.5	1.2	0.5	7.1
	0.2	1.6	0.2	9.3
	0.1	2.0	0.1	12.0
	0.01	3.3	0.01	23.0
8 parallel connected ch.	-	-	29	1.7
	-	-	20	2.1
V_{OC} = 9.8 V	6.7	0.4	10	2.9
I_{SC} = 83.2 mA	5	0.5	5	3.6
P_O = 204.0 mW	2	0.76	2	4.7
Ci = 20 nF	1	0.96	1	5.7
Li = 0 mH	0.5	1.2	0.5	6.9
	0.2	1.6	0.2	9.1
	0.1	1.9	0.1	11
	0.01	3.3	0.01	23
16 parallel connected ch.	-	-	7.7	2.1
	-	-	5	2.8
V_{OC} = 9.8 V	1.8	0.53	2	4.2
I_{SC} = 164 mA	1	0.77	1	5.3
P_O = 402 mW	0.5	1.0	0.5	6.6
Ci = 40 nF	0.2	1.5	0.2	8.9
Li = 0 mH	0.1	1.8	0.1	11
	0.01	3.3	0.01	23

Wiring legend
Connection allocation – Digital Input Output Module Type 9470/32

	X1		X2
channel 0	1(+), 2(-)	channel 8	17(+), 18(-)
channel 1	3(+), 4(-)	channel 9	19(+), 20(-)
channel 2	5(+), 6(-)	channel 10	21(+), 22(-)
channel 3	7(+), 8(-)	channel 11	23(+), 24(-)
channel 4	9(+), 10(-)	channel 12	25(+), 26(-)
channel 5	11(+), 12(-)	channel 13	27(+), 28(-)
channel 6	13(+), 14(-)	channel 14	29(+), 30(-)
channel 7	15(+), 16(-)	channel 15	31(+), 32(-)

Notes:

1. Intrinsically safe apparatus shall be switches or an FM approved System or Entity device connected in accordance with the manufacturer´s installation instructions.
2. For Entity concept use the appropriate parameters from above to ensure the following:
   V_{OC} or $V_t \leq V_{max}$ $\quad C_a \geq C_i + C_{leads}$
   I_{SC} or $I_t \leq I_{max}$ $\quad L_a \geq L_i + L_{leads}$
3. Suitable separation must be maintained between wiring of each I.S. input channel.
4. General Notes (see Page 1)

WARNING: Substitution of components may impair Intrinsic Safety.
AVERTISSEMENT: Substitution de composants peut compromettre la sécurité intrinsèque.

The safety relevant statements of this document may be transferred into the operating instructions.
Transferring the text, editorial changes of equivalent meaning are allowed.

			2013	Date	Name	Certification drawing	Scale
			drawn	08.02.	Reistle	**Digital Input Output Module Type 9470/32-16-1***	none
			checked		Kaiser		Sheet 15 of 32
					STAHL	9400 6 031 001 1	Agency FM
02	26.02.2014	Bagusch					
01	22.01.2014	Bagusch					
Version	Date	Name				Ers. f. / Ers. d.	A4

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